

ICES 2013 Abstract:**Title:**

Microbial Monitoring of Pathogens by Comparing Multiple Real-Time PCR Platforms for Potential Space Applications

Abstract: (300 words or less)

The International Space Station (ISS) is a closed environment with rotations of crew and equipment each introducing their own microbial flora making it necessary to monitor the air, surfaces, and water for microbial contamination. Current microbial monitoring includes labor and time intensive methods to enumerate total bacterial and fungal cells with limited characterization during in-flight testing. Although this culture-based method has been sufficient for monitoring the ISS, future long duration missions will need to perform more comprehensive characterization in-flight, since sample return and ground characterization may not be available. A workshop was held in 2011 at the Johnson Space Center to discuss alternative methodologies and technologies suitable for microbial monitoring for these long-term exploration missions where molecular-based methodologies, such as polymerase chain reaction (PCR), were recommended. In response, a multi-center (Marshall Space Flight Center, Johnson Space Center, Jet Propulsion Laboratory, and Kennedy Space Center) collaborative research effort was initiated to explore novel commercial-off-the-shelf hardware options for spaceflight environmental monitoring. The goal was to evaluate quantitative/semi-quantitative PCR approaches to space applications for low cost in-flight rapid identification of microorganisms affecting crew safety. The initial phase of this project identified commercially available platforms that could be minimally modified to perform nominally in microgravity followed by proof-of-concept testing on the highest qualifying candidates with a universally available test organism, *Salmonella enterica*. The platforms evaluated during proof-of-concept testing included the iCubate 2.0® (iCubate, Huntsville, AL), RAZOR EX® (BioFire Diagnostics; Salt Lake City, Utah) and SmartCycler® (Cepheid; Sunnyvale, CA). The analysis identified two potential technologies (iCubate 2.0 and RAZOR EX) that were able to perform sample-to-answer testing with cell sample concentrations between 50 to 400 cells. In addition, the commercial systems were evaluated for initial flight safety and readiness, sample concentration needs were reviewed, and a competitive procurement of commercially available platforms was initiated.